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(54) **IMMERSIVE DISPLAY WITH PERIPHERAL ILLUSIONS**

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See application file for complete search history.

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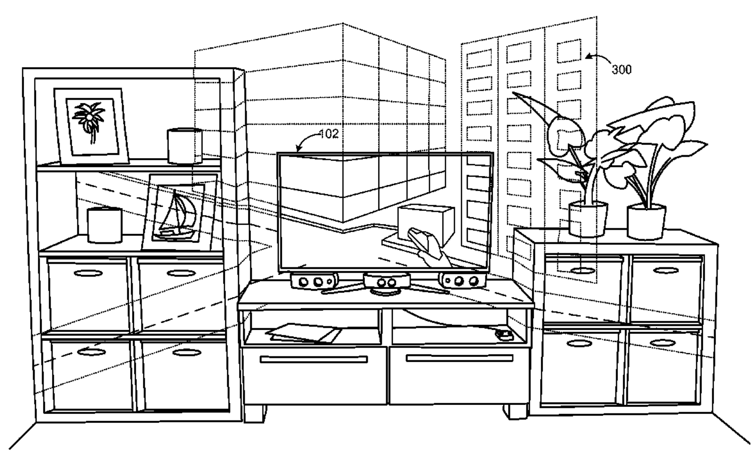
(57) **ABSTRACT**

A primary display displays a primary image. A peripheral illusion is displayed around the primary display by an environmental display so that the peripheral illusion appears as an extension of the primary image.

19 Claims, 8 Drawing Sheets



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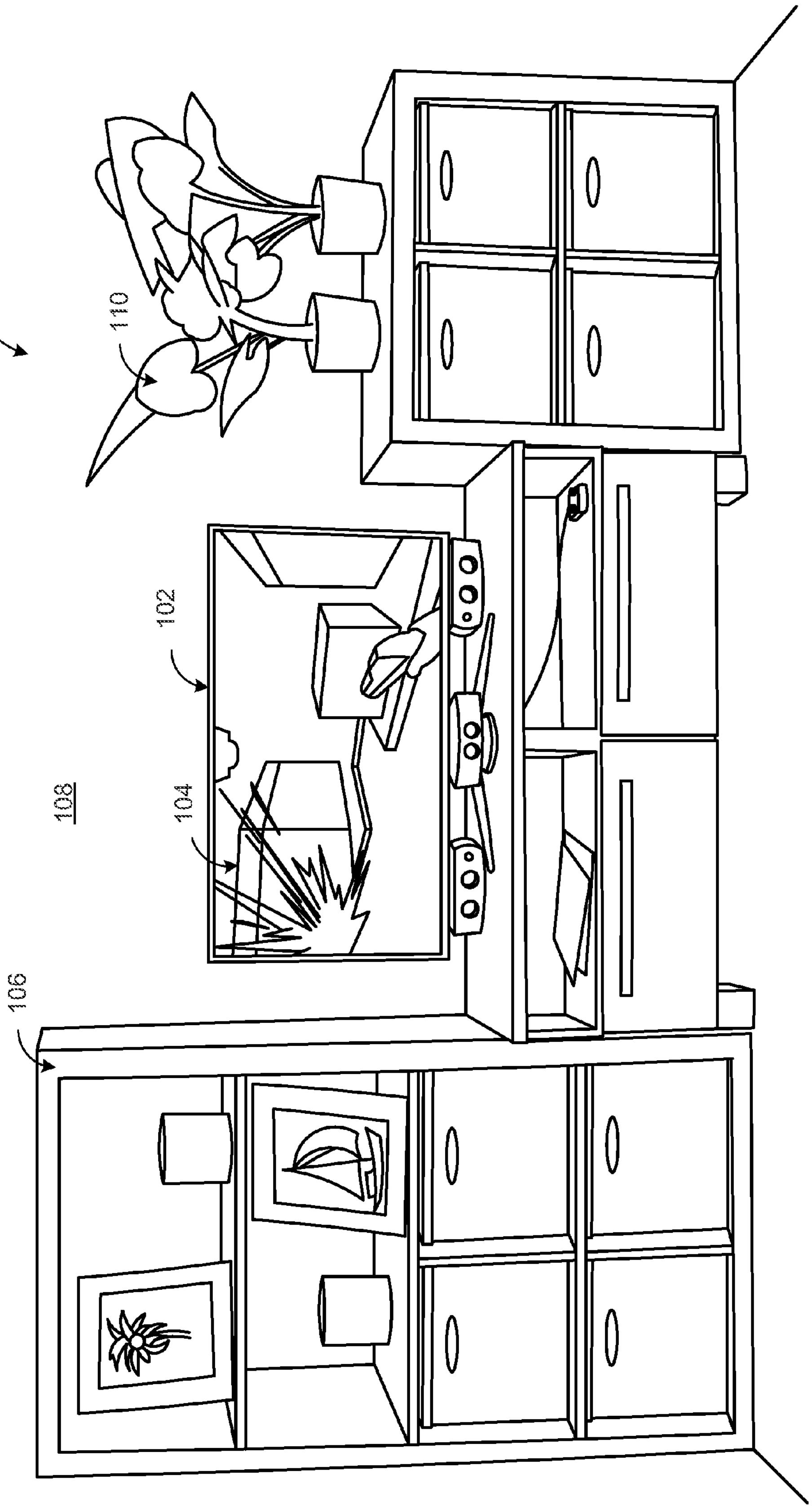

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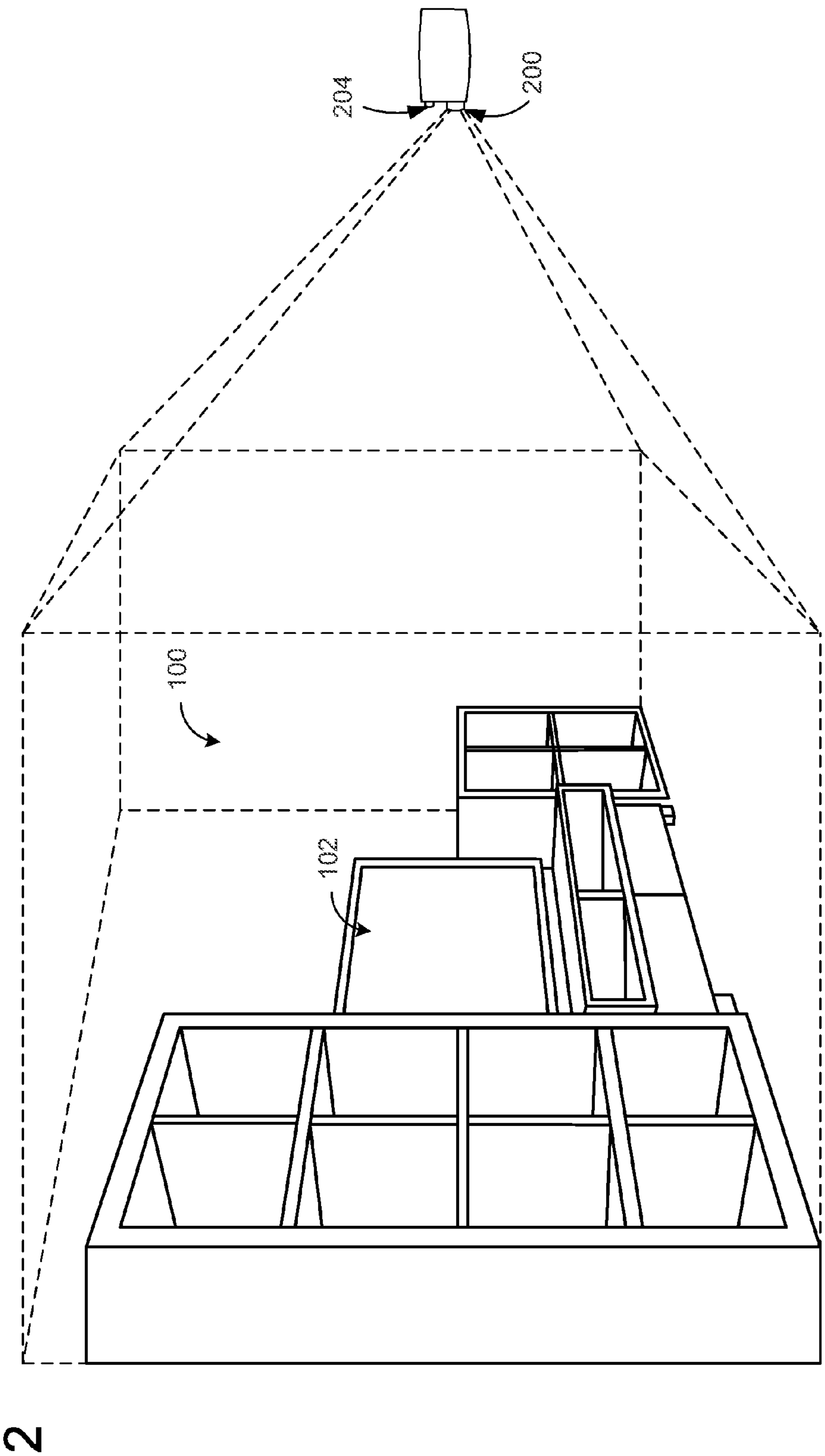

FIG. 2

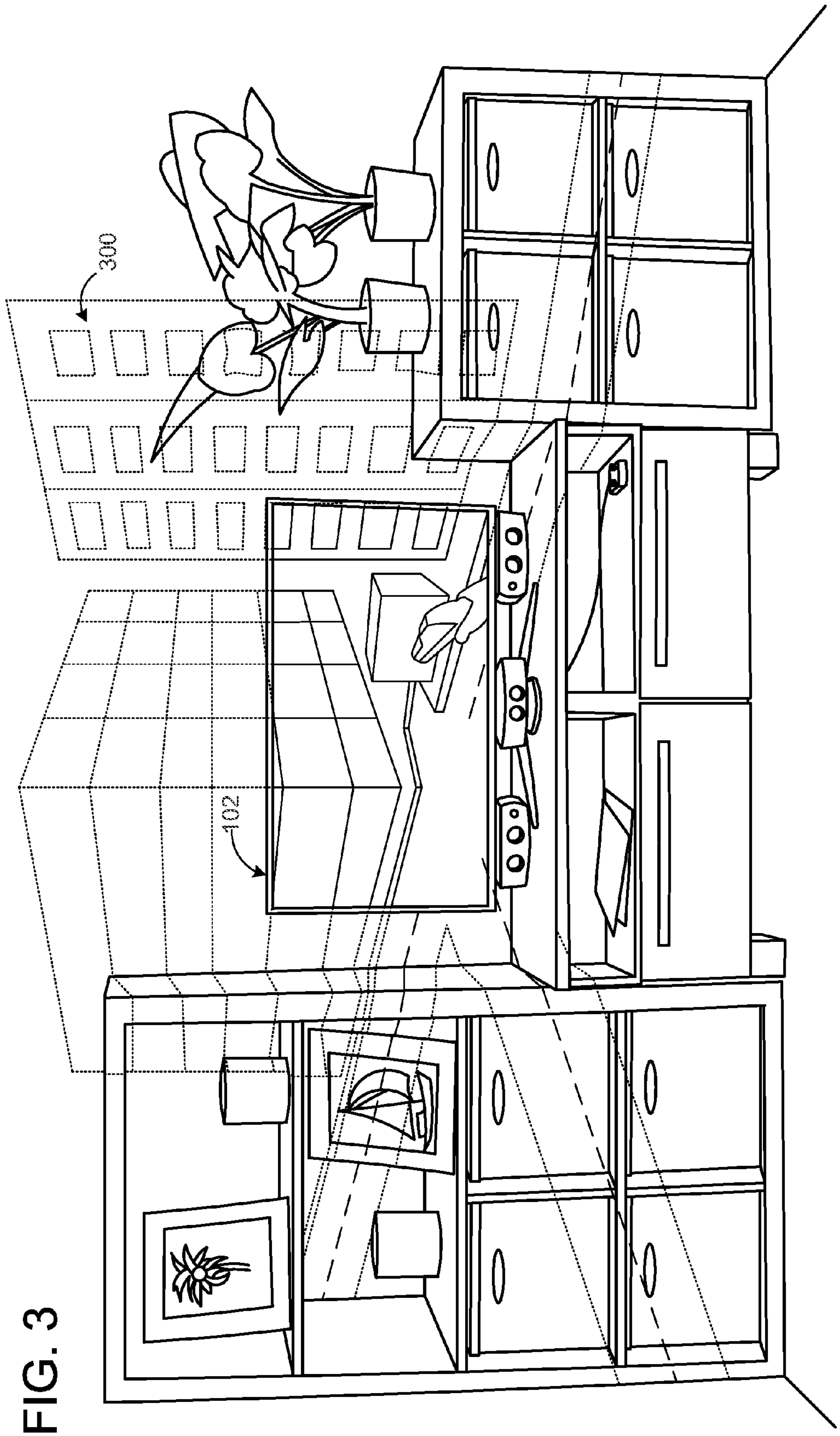

FIG. 3

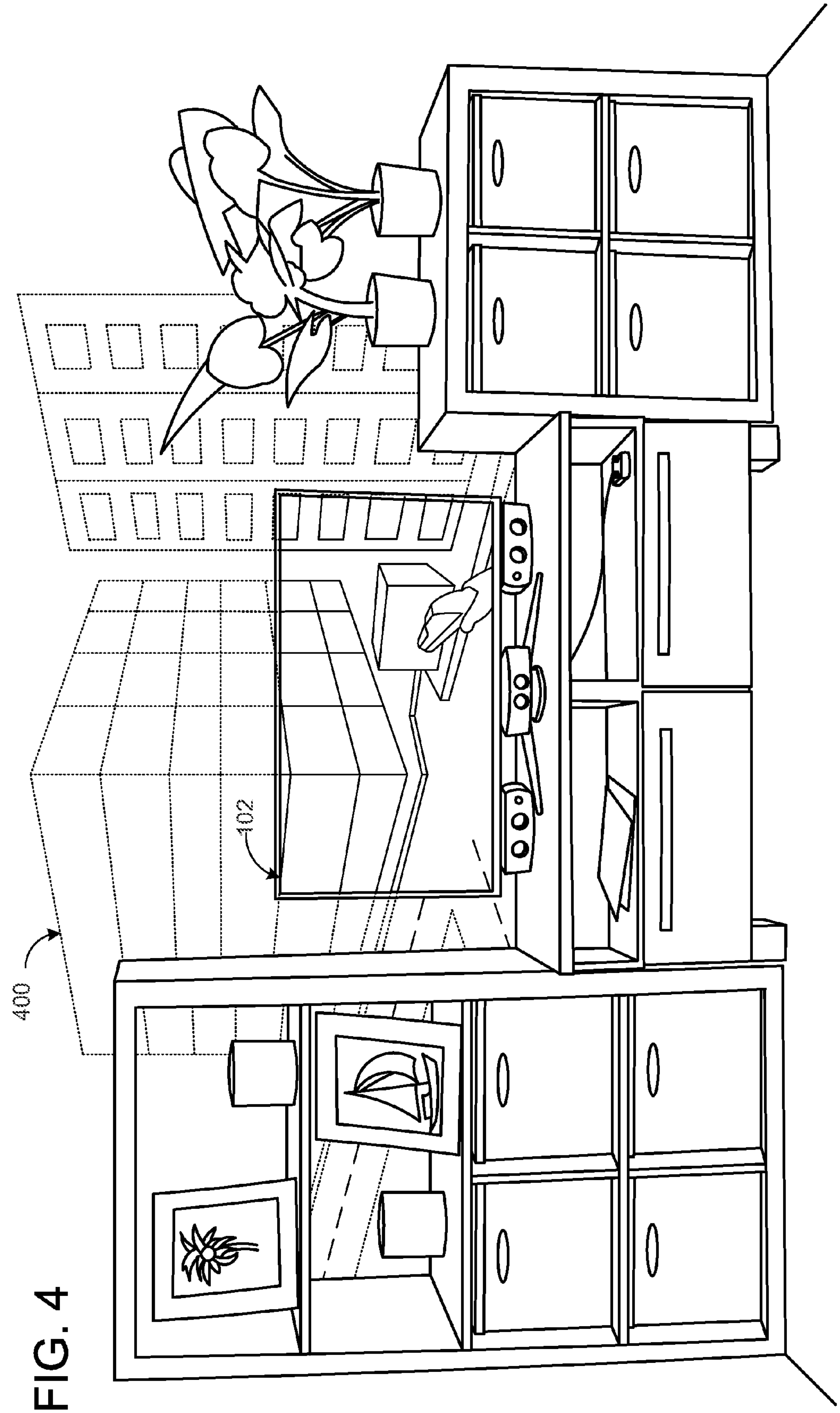

FIG. 4

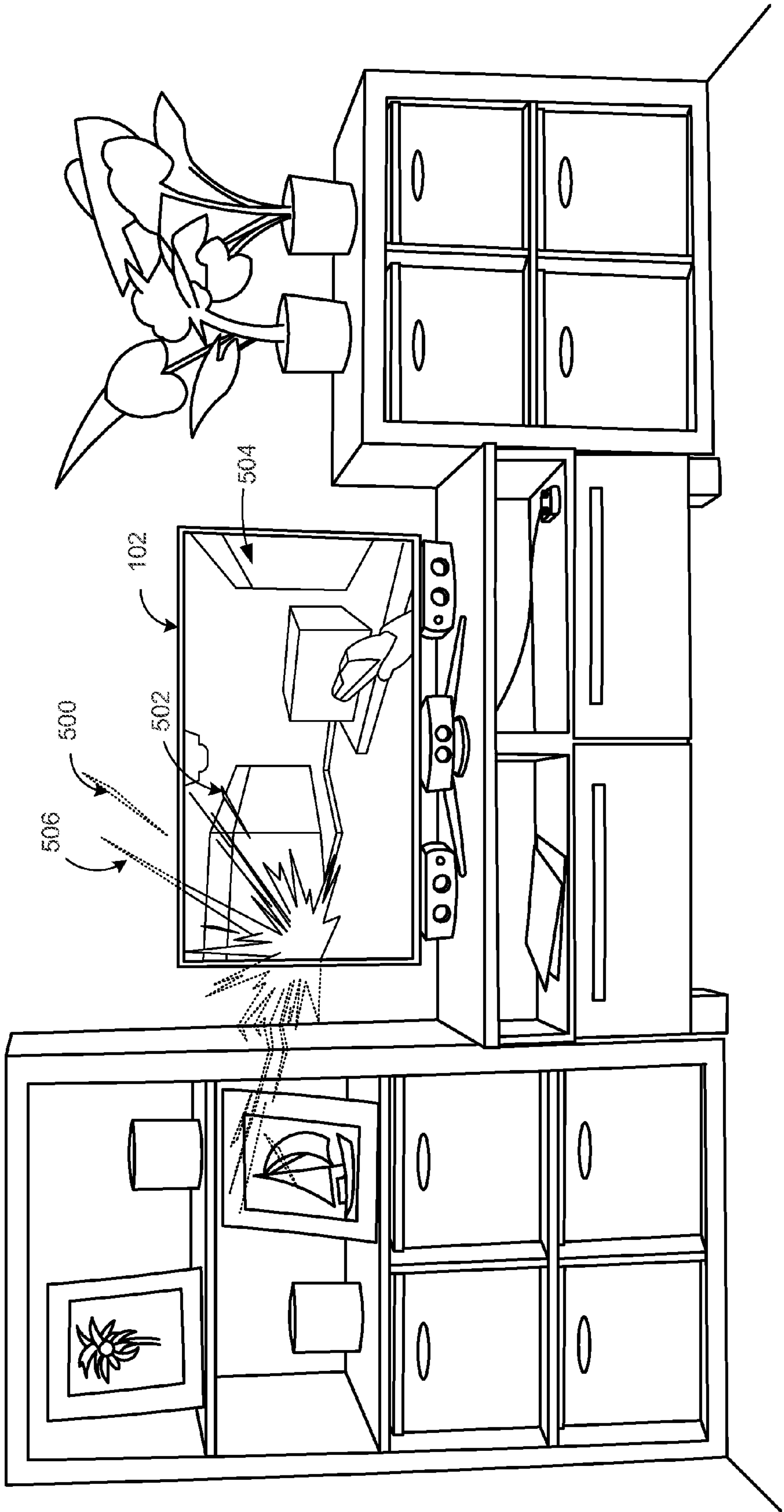

FIG. 5

FIG. 6

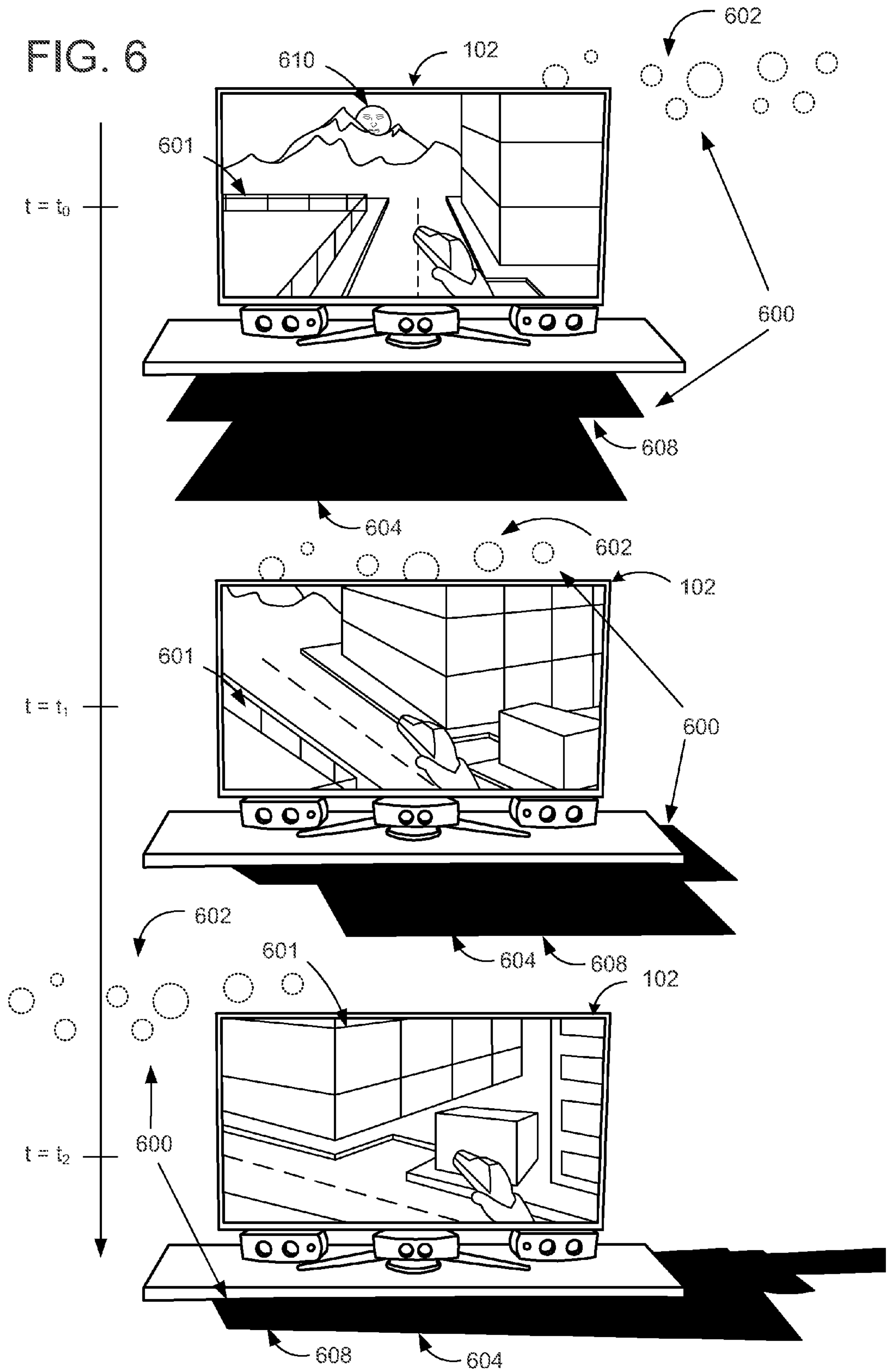
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FIG. 7

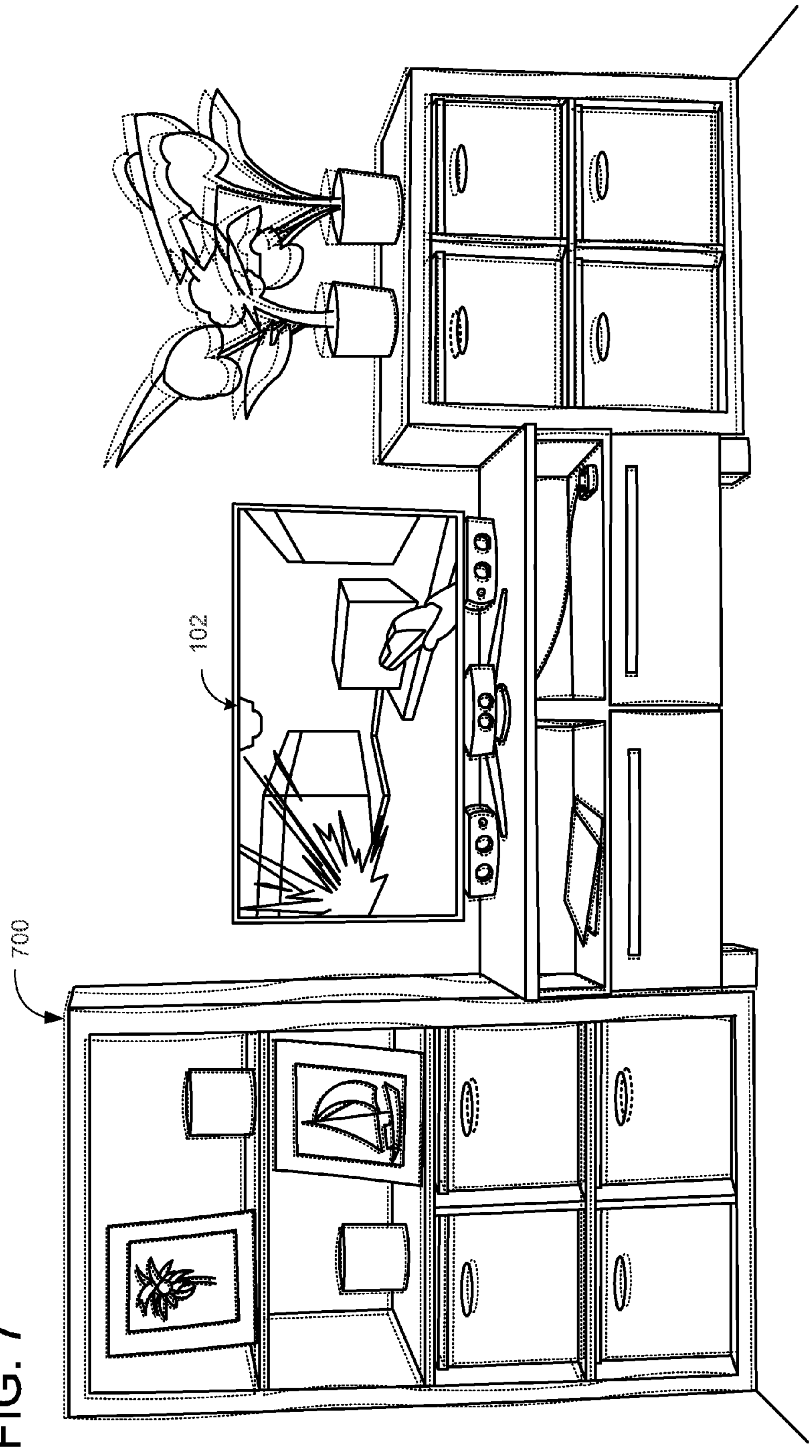
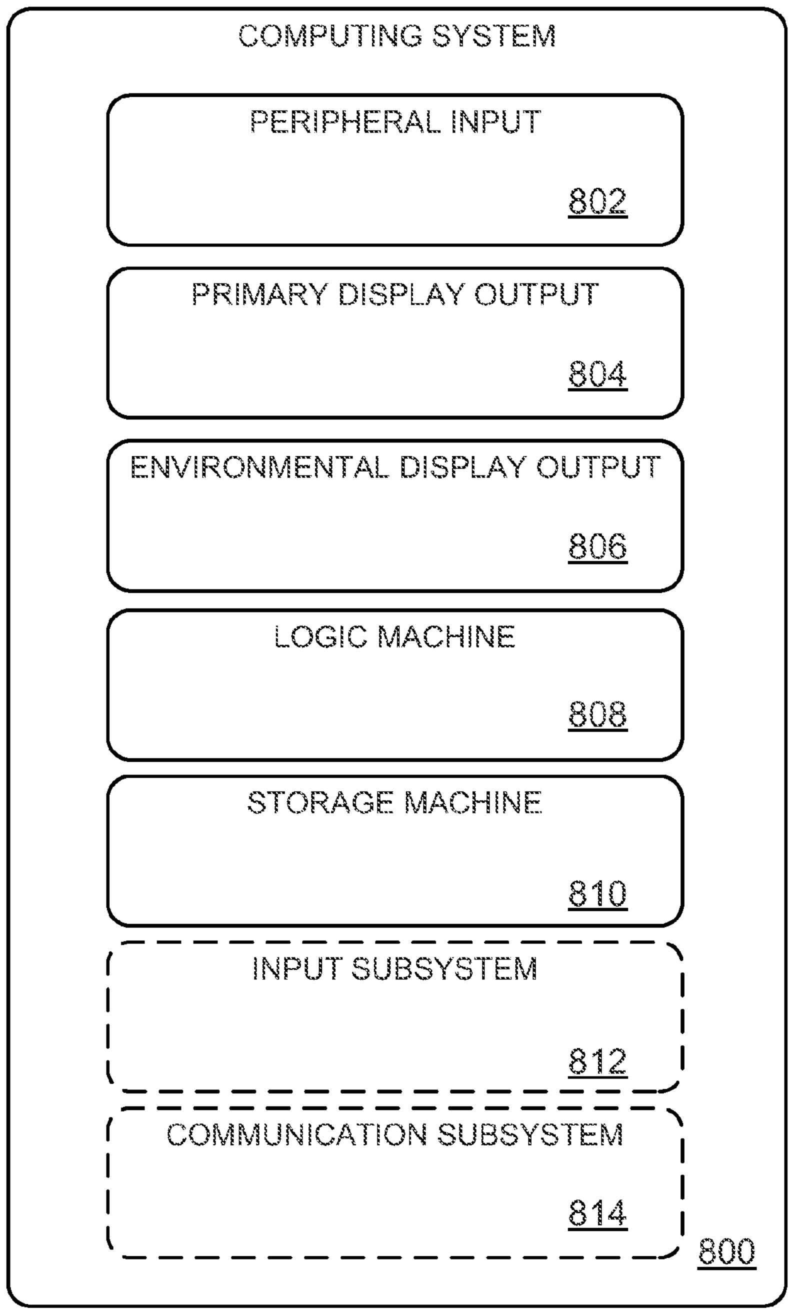


FIG. 8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806
LOGIC MACHINE
808
STORAGE MACHINE
810
INPUT SUBSYSTEM
812
COMMUNICATION SUBSYSTEM
814
800

IMMERSIVE DISPLAY WITH PERIPHERAL ILLUSIONS

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. Provisional Application No. 61/749,779, filed Jan. 7, 2013, and titled IMMERSIVE DISPLAY WITH PERIPHERAL ILLUSIONS, and is a continuation-in-part of U.S. Utility application Ser. No. 13/039,179, filed Mar. 2, 2011, and titled IMMERSIVE DISPLAY EXPERIENCE, the above applications are hereby incorporated herein by reference in their entireties for all purposes.

BACKGROUND

User enjoyment of video games and other media experiences can be increased by making the experience more realistic. Previous attempts to make the experience more realistic have included switching from two-dimensional to three-dimensional animation techniques, increasing the resolution of game graphics, producing improved sound effects, and creating more natural game controllers.

SUMMARY

This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter. Furthermore, the claimed subject matter is not limited to implementations that solve any or all disadvantages noted in any part of this disclosure.

A primary display displays a primary image. A peripheral illusion is displayed around the primary display by an environmental display so that the peripheral illusion appears as an extension of the primary image.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows an example display environment including a primary display.

FIG. **2** shows the display environment of FIG. **1** including an environmental display and the primary display.

FIGS. **3-7** show the display environment of FIG. **1** as it appears when different peripheral illusions are displayed around the primary display by an environmental display.

FIG. **8** schematically shows an example computing system in accordance with the present disclosure.

DETAILED DESCRIPTION

The present disclosure is directed to the display of peripheral images around a primary display. In particular, a variety of different peripheral illusions that may be achieved by displaying peripheral images around a primary display are disclosed. According to embodiments of the present disclosure, the area surrounding a primary display may be augmented with visualizations to enhance traditional gaming or other viewing experiences. Visualizations in the periphery can enhance, negate, or distort the existing physical environment and thus enhance the content displayed on the primary display. Such peripheral illusions can change the appearance of the room, induce apparent motion, extend the field of view, and/or enable entirely new game or viewing experiences.

Peripheral illusions may also be used with broadcast videos. As an example, a primary or secondary broadcaster may send additional information to an environmental display that is synchronized with the main broadcast so as to allow for concurrent viewing of a main broadcast and additional information related to that broadcast. Examples of additional information may include maps, commentaries, chats, viewer statistics, etc.

FIG. **1** shows an example display environment **100** in which an immersive display experience may be provided. The environment includes a primary display **102** (e.g., television) used to display a primary image (e.g., primary image **104** of primary display **102**), and a display environment including several objects (e.g., bookcase **106**, wall **108**, and plant **110**).

FIG. **2** shows an example environmental display **200** used to display a peripheral illusion in display environment **100**. A peripheral image from the environmental display **200** may be projected as a peripheral illusion around the primary display **102** so that the peripheral illusion appears as an extension of the primary image displayed by the primary display.

It is to be understood that peripheral illusions may be displayed for a user using a variety of different display technologies without departing from the scope of this disclosure. Environmental display **200** may include a projector, a wide-angle projector, an ultra-wide field of view projector, a 360 degree field of view projector, or a combination of two or more different projectors. When one or more projectors are used, such projectors may be positioned at a variety of different locations without departing from the scope of this disclosure. As one non-limiting example, a projector may be placed in front of or behind a user so as to project light in the general direction of a primary display. The projector can be directly connected to a gaming console or other video driver as a secondary display.

As another example, a see-through display may be used to display augmented reality images that appear to be around a primary display when a user views the primary display through the see-through display.

In still other embodiments, large secondary OLED displays mounted around a primary display (e.g., on the wall), specialized laser projectors, and/or other secondary displays may be used. In general, any secondary display capable of adding visual stimuli around a primary display may be used.

FIG. **2** also shows a sensor **204** that may be used to model the geometry, color, ambient lighting conditions, and/or other aspects of display environment **100**. Sensor **204** may include a depth camera (e.g., structured light, time-of-flight, stereoscopic, or other depth camera), a color camera, a microphone, and/or other subsensors.

Sensor **204** may be used to determine a position of primary display **102** within display environment **100**. As such, the environmental display can mask the primary display so that projected images are displayed around the primary display without projecting images directly onto the primary display. Other objects may be similarly masked. Furthermore, geometric, color, and lighting information may be determined so that geometric-, color-, and/or lighting-corrected images may be perceived by the viewer. When the environmental display takes the form of a see-through display, a sensor may be integrated with the see-through display, thus allowing augmented reality images to be real-time masked, geometric-, color-, and/or lighting corrected.

Calibration of the system enables illusions to tightly match the on-screen content. For example, in embodiments that utilize one or more projectors, the calibration of the system may include two steps, which may be performed automatically: calibrating the projector to the sensor and calibrating the location of the primary display in the peripheral image. These steps may be achieved by displaying test images at different locations with the environmental and primary displays, respectively, and recognizing where the images appear in the sensor's field of view. It is important to note that the sensor may only be used during calibration, and thus in embodiments where the sensor is separable from the environmental display, the user may move the sensor if the physical configuration of the room does not change after calibration. In some embodiments, a sensor may be used continuously to allow for real-time changes in room geometry (e.g., moving furniture or people in the scene). The sensor optionally may be integrated with the environmental display. It is to be understood that any suitable calibration technique may be used without departing from the scope of this disclosure.

In addition to calibration, the acquired 3D image of the scene geometry may be used to demonstrate illusions that respond in a physically realistic manner to people, furniture, and/or other objects in the display environment.

The immersive display systems described herein are capable of presenting a variety of peripheral illusions in real-time while augmenting video games or other video content (e.g., television, movies, sports, webpages, home movies, broadcast television etc.). Peripheral illusions may take advantage of the fact that the illusions occur in the peripheral vision of the user. Illusions that may not seem realistic when a user is focusing on the illusions may be quite effective in the user's peripheral vision. Many illusions focus primarily on introducing motion in the user's peripheral vision as opposed to accurately reproducing a certain color. Furthermore, many illusions leverage the notion that nudging the existing surface color may be more effective than trying to reproduce an arbitrary surface color. In some embodiments, the peripheral illusions may be directed to an area immediately surrounding a primary display (e.g., all or part of one wall in a room). In other embodiments, peripheral illusions may be projected around a greater field of view, up to and including the entire room. The quality of peripheral illusions may optionally be drawn as a function of the current field of view of the viewers (e.g., peripheral illusions closer to a viewer's focus may be drawn with higher quality than peripheral illusions farther from a viewer's focus).

Peripheral illusions that augment the physical reality of the display environment, rather than replacing it, offer the advantage of enhancing the realism of the virtual world by causing it to interact with the physical reality around the primary display. In this case, the viewer knows that objects in her immediate surrounding are real and the reality of the game can seem more realistic due to changes in the physical reality that correspond to events that occur in the virtual reality.

Peripheral illusions that only modify the existing surface color and not the geometry of the room are view independent, and can be viewed from multiple users from any position within the room. Illusions that add to or modify the geometry of the room are inherently view dependent and work best from a fixed point within the room. However, even view-dependent illusions typically have a rather large sweet spot from which the illusions remain effective. Additionally, projective texturing techniques may be used to move the view dependent sweet spot about a room such that the view dependent sweet spot is a location where a viewer is likely to be sitting. Generally, the more complex the room's furniture and the more geometry that is modified virtually, the more view dependent the effect.

FIGS. **3-7** show example peripheral illusions. It is to be understood that the illustrated illusions are provided as examples and are in no way intended to be limiting. Games, video, and/or other viewing experiences may be enhanced with a variety of different peripheral illusions displayed around a primary display without departing from the scope of this disclosure.

FIG. **3** shows a peripheral illusion **300** that increases immersion by extending the content from the primary display out into the room, replacing the physical reality with a game's reality. The peripheral illusion **300** may include a full color extension of the primary image, and/or an extension of high contrast edges of the primary image. In general, the peripheral illusion increases the effective screen size of the primary display by extending images from the primary display out into the rest of the room.

A peripheral image may be projected onto non-flat, non-white projection surfaces with geometric and/or color compensation. As stated above, the ability to compensate for the existing surface color may be limited, and this effect may be enhanced when a user is still focusing on the primary display.

FIG. **4** shows a peripheral illusion **400** in which the game extends only onto the rear wall surrounding the primary display **102**. In this non-limiting example, peripheral illusion **400** may be masked from one or more surfaces in the display environment. The one or more masked objects may include the primary display **102**, all surfaces except those surfaces within a threshold distance of a projection plane (e.g., a wall behind the primary display), all surfaces nearer and/or farther than a tunable distance threshold, a user within the display environment, and/or selected objects within the display environment.

The wall, such as wall **108** of FIG. **1**, or any other surface within a threshold distance of a segmented projection plane, can be found using any suitable method, such as a recursive RANSAC plane fitting procedure seeded with the location of the primary display. For example, in the illustrated embodiment, light is not projected onto the plants, bookshelf, decorations, or floor. It is also worth noting that the primary display may be masked from projection in all illusions.

FIG. **5** shows a peripheral illusion **500** in which only certain game elements escape the primary image **502**. For instance, in the illustrated first-person shooter, only explosion **506** is bled out of the primary image **502**. Therefore, peripheral illusions may include an extension of selected elements of the primary image while not extending other elements (e.g., building **504**).

The above described illusions increase immersion, induce apparent motion, and provide additional information about the game content. The illusions can be utilized individually or together. The illusions described above may be implemented with rendering level access to the video game content.

With or without rendering level access, apparent motion may be induced through peripheral visual flow. If rendering level access is not available, images displayed by the primary display may be analyzed to assess relative motion in the game or other viewing experience, and such motion may be enhanced with peripheral illusions.

FIG. **6** shows a peripheral illusion **600** that enhances perception of apparent motion. In this non-limiting example, the peripheral illusion **600** includes a plurality of motion trackers (e.g., dots **602**) synced with a changing perspective of the primary image **601** on the primary display **102**. As shown from time t_o to t_2, dots **602** move with the motion of the game. By sizing the dots differently, larger dots appear closer to the user and smaller dots appear more distant. The position and size of the individual dots may be moved/changed to create the illusion of apparent 3D motion.

A peripheral illusion in which an infinite grid moves with the motion in the game may also be used to create the illusion of apparent motion. When the user moves left or right, the grid moves in the opposite direction (the direction that objects in the game world move). When the user moves forwards and backwards, the grid zooms in and out, respectively. The animation of the grid, dots, or other visual trackers may give an impression of movement through space.

FIG. **6** also shows a peripheral illusion **604** used to change the appearance of the physical space around the primary display **102**. In this non-limiting example, the peripheral illusion **604** includes apparent lighting (e.g., shadow **608**) that extends virtual lighting (e.g., light from sun **610**) of the primary image **601** as displayed by the primary display **102**. Therefore, virtual lighting (e.g., light from sun **610**) visible at a character's perspective in a video game may be used to change the appearance of the physical space around the primary display. Such shadow effects may be achieved by oversaturating non-shadow areas in the display environment with projected light, while masking the shadowed area.

The lighting in the room also can be changed based upon the mood or theme in the game. For example, for a space scene, the room could be illuminated by point light sources with harsh shadows. The lighting conditions within the virtual environment may be replicated in the physical space. For example, soft shadows and lighting from a single point light source may be implemented, where the system uses the closest point-light source in the game.

Peripheral illusions may also include a visual representation of the display environment on which the peripheral illusion is projected. The visual representation can be used to augment the display environment to match the theme or mood of a particular game or viewing experience. For example, if a cartoon game is being played, the display environment can be augmented to appear cartoonish.

Peripheral illusions may also include enhancements to the display environment. For example, illumination light may be projected into the room according to the location of specific room elements—light may be projected around light switches, around objects hung on the wall, in corners, etc.

The visual representation may also include a color distortion configured to cause a color of the display environment to appear to change. While it is difficult to completely replace existing surface colors, it is possible to augment the saturation or value of existing surface colors. For example, room colors can be super saturated to look like a cartoon by simply projecting the color of the surface back onto itself. As examples, red surfaces receive red light, blue surfaces receive blue light, etc. Similarly, colors may be desaturated, the scene may be outlined in silhouette edges, and/or other transformation may be made to the physical space. More complicated texture replacement is also possible, for example with procedural texturing.

FIG. **7** shows a peripheral illusion **700** causing the display environment to appear to move (e.g., wobble). Such a peripheral illusion may be useful when paired with an explosion in a video game or film, for example. The position and/or size of objects in the room may be temporarily modified and/or distorted by projecting a distorted image of the scene back onto the scene. For example, an over-saturated projection of the room may be aligned with the room and the projected image may be distorted so that edges of the image move with a radial wobble, for example (e.g., the illusion displaces the original surface texture in an expanding, radial sinusoidal wave). Due to a projector's limited ability to compensate for surface color, these effects may be most effective if the displacements are small and short lived. As with the other peripheral illusions, because the user is typically focused on the primary display, the peripheral projections can be quite believable, and the room can actually seem to shake and/or bend as a result of the peripheral illusion.

Physical objects in the room can also be moved according to a predetermined script to enhance the viewing experience and/or display of peripheral illusions. For example, when a viewer bumps into a wall in the virtual reality, there may be a quick scale of the projected scene followed by a return to the normal scale. A slight lean (i.e., slight off-axis rotation) of the peripheral illusion may also be used in a driving game when a user drives around a banked corner.

A peripheral illusion in which an element of the primary image as displayed by the primary display moves from the primary image to the peripheral illusion may also be used. As an example, a grenade may roll out of the primary display, then bounce and roll around the physical environment according to a physics simulation using the room geometry. In this way, elements can appear to leave the primary display and bounce off of physical surfaces in the room. The element of the peripheral image as projected by the environmental display may also move from the peripheral illusion to the primary display. For example, a user could "pick-up" the grenade and throw it back "into" the primary display.

A peripheral illusion in which elements in the game enter and leave the primary display may also include snow falling in the primary display. In an example, falling snow may interact with the physical environment, briefly collecting on surfaces in the room. Similar to FIG. **6**, the snow may move according to the movement of the user in the virtual environment, allowing the user to walk, ski, drive, or otherwise move through falling snow. Further, the color of the surfaces that would collect snow may be gradually whitened.

As described by way of the preceding examples, the peripheral illusions may include effects that depend on the depth/visible image of the room. The peripheral illusions can be physically responsive to the room geometry. The geometry and/or the appearance of the room is not only used for un-distortion of the projected visuals, but also may be used for physics behavior computations and/or content masking.

The audio of a game and/or movie may also be affected by events occurring in the primary image and/or peripheral illusion. For example, a virtual object may hit a physical object through the peripheral illusion and a corresponding explosion may sound. In another non-limiting example, a gunshot may echo in the room, and the viewer may hear the sound bounce from one side of the room to another.

The peripheral illusions may be extensions of the images displayed by the primary display, or the peripheral illusions may be completely different from the images displayed by the primary display. For example, when watching a black and white movie, the projector might turn a living room into a black and white experience. As another example, when playing a racing game, the projector may be used to implement weather effects (e.g., snow, rain, fog) that react to driving and the room configuration.

Peripheral illusions may optionally be executed by retrieving the rendering information for the peripheral illusions directly from the content defining the primary image. In such embodiments, the content creators (e.g., game designers) account for creating such peripheral illusions. However, peripheral illusions may be driven by extracting camera motion cues from the primary display images and/or by capturing the controller input. This allows for "automatic" driving of such illusions without having access to the game code.

Effects may be driven by the game or other viewing experience or potentially delivered in a separate track in parallel to the screen content. For example, an effects track that accompanies a movie in the same way as a subtitle track could trigger peripheral illusions. Such effects tracks may be delivered to a user by the same or a separate vendor than the original broadcaster/creator.

In some embodiments, the methods and processes described herein may be tied to a computing system of one or more computing devices. In particular, such methods and processes may be implemented as a computer-application program or service, an application-programming interface (API), a library, and/or other computer-program product.

FIG. **8** schematically shows a non-limiting embodiment of an interactive computing system **800** configured to provide an immersive display experience within a display environment. The computing system **800** can enact one or more of the methods and processes described above. Computing system **800** is shown in simplified form. Computing system **800** may take the form of one or more personal computers, server computers, tablet computers, home-entertainment computers, network computing devices, gaming devices, mobile computing devices, mobile communication devices (e.g., smart phone), augmented reality device, and/or other computing devices. In some embodiments, the computing system may be integrated with a stand-alone environmental display (e.g., projector) including a depth camera and/or other sensors. In such embodiments, the stand-alone environmental display may communicate with another device that controls the primary display. In some embodiments, the same device may control both the primary and environmental displays.

Computing system **800** includes a peripheral input **802**, a primary display output **804**, an environmental display output **806**, a logic machine **808**, and a storage machine **810**. Computing system **800** may optionally include input subsystem **812**, communication subsystem **814**, and/or other components not shown in FIG. **8**.

Peripheral input **802** may be configured to receive a depth input from a depth camera and/or other sensor information from other sensors. As a non-limiting example, peripheral input **802** may include a universal serial bus or any suitable wired or wireless interface.

Primary display output **804** may be configured to output a primary image (such as primary image **104** of FIG. **1**) to a primary display (such as primary display **102** of FIG. **2**). As a non-limiting example, primary display output may include an HDMI or any suitable wired or wireless interface.

Environmental display output **806** may be configured to output a peripheral image to an environmental display (such as environmental display **200** of FIG. **2**). As a non-limiting example, environmental display output may include an HDMI or any suitable wired or wireless interface.

Logic machine **808** includes one or more physical devices configured to execute instructions. Logic machine **808** may be operatively connectable to the primary display via the primary display output **804**, to the environmental display **200** via the environmental display output **806**, and to the depth camera or other sensors via the peripheral input **802**. The logic machine may be configured to execute instructions that are part of one or more applications, services, programs, routines, libraries, objects, components, data structures, or other logical constructs. Such instructions may be implemented to perform a task, implement a data type, transform the state of one or more components, achieve a technical effect, or otherwise arrive at a desired result.

The logic machine may include one or more processors configured to execute software instructions. Additionally or alternatively, the logic machine may include one or more hardware or firmware logic machines configured to execute hardware or firmware instructions. Processors of the logic machine may be single-core or multi-core, and the instructions executed thereon may be configured for sequential, parallel, and/or distributed processing. Individual components of the logic machine optionally may be distributed among two or more separate devices, which may be remotely located and/or configured for coordinated processing. Aspects of the logic machine may be virtualized and executed by remotely accessible, networked computing devices configured in a cloud-computing configuration.

Storage machine **810** includes one or more physical devices configured to hold instructions executable by the logic machine to implement the methods and processes described herein. Storage machine **810** may also hold instructions that allow the logic machine to determine a location of the primary display from the depth input, output the primary image to the primary display, and output the peripheral image to the environmental display for projection as a peripheral illusion such that the peripheral illusion appears as an extension of the primary image. When such methods and processes are implemented, the state of storage machine **810** may be transformed (e.g., to hold different data).

Storage machine **810** may include removable and/or built-in devices. Storage machine **810** may include optical memory (e.g., CD, DVD, HD-DVD, Blu-Ray Disc, etc.), semiconductor memory (e.g., RAM, EPROM, EEPROM, etc.), and/or magnetic memory (e.g., hard-disk drive, floppy-disk drive, tape drive, MRAM, etc.), among others. Storage machine **810** may include volatile, nonvolatile, dynamic, static, read/write, read-only, random-access, sequential-access, location-addressable, file-addressable, and/or content-addressable devices.

It will be appreciated that storage machine **810** includes one or more physical devices. However, aspects of the instructions described herein alternatively may be propagated by a communication medium (e.g., an electromagnetic signal, an optical signal, etc.) that is not held by a physical device for a finite duration.

Aspects of logic machine **808** and storage machine **810** may be integrated together into one or more hardware-logic components. Such hardware-logic components may include field-programmable gate arrays (FPGAs), program- and application-specific integrated circuits (PASIC/ASICs), program- and application-specific standard products (PSSP/ASSPs), system-on-a-chip (SOC), and complex programmable logic devices (CPLDs), for example.

When included, input subsystem **812** may comprise or interface with one or more user-input devices such as a keyboard, mouse, touch screen, or game controller. In some embodiments, the input subsystem may comprise or interface with selected natural user input (NUI) componentry. Such componentry may be integrated or peripheral, and the transduction and/or processing of input actions may be handled on- or off-board. Example NUI componentry may include a microphone for speech and/or voice recognition; an infrared, color, stereoscopic, and/or depth camera for machine vision and/or gesture recognition; a head tracker, eye tracker, accelerometer, and/or gyroscope for motion detection and/or intent recognition; as well as electric-field sensing componentry for assessing brain activity.

When included, communication subsystem **814** may be configured to communicatively couple computing system **800** with one or more other computing devices. Communication subsystem **814** may include wired and/or wireless communication devices compatible with one or more different communication protocols. As non-limiting examples, the communication subsystem may be configured for communication via a wireless telephone network, or a wired or wireless local- or wide-area network. In some embodiments, the communication subsystem may allow computing system **800** to send and/or receive messages to and/or from other devices via a network such as the Internet.

It will be understood that the configurations and/or approaches described herein are exemplary in nature, and that these specific embodiments or examples are not to be considered in a limiting sense, because numerous variations are possible. The specific routines or methods described herein may represent one or more of any number of processing strategies. As such, various acts illustrated and/or described may be performed in the sequence illustrated and/or described, in other sequences, in parallel, or omitted. Likewise, the order of the above-described processes may be changed.

The subject matter of the present disclosure includes all novel and nonobvious combinations and subcombinations of the various processes, systems and configurations, and other features, functions, acts, and/or properties disclosed herein, as well as any and all equivalents thereof.

The invention claimed is:

1. An interactive computing system configured to provide an immersive display experience within a display environment, the system comprising:

an environmental display output configured to output a peripheral image to an environmental display;

a logic machine operatively connectable to the environmental display via the environmental display output; and

a storage machine holding instructions executable by the logic machine to output the peripheral image to the environmental display for projection as a peripheral illusion around a primary display, the peripheral illusion including a visual representation of the display environment on which the peripheral illusion is projected.

2. The interactive computing system of claim **1**, wherein the peripheral illusion is masked from one or more surfaces in the display environment.

3. The interactive computing system of claim **2**, wherein the one or more masked surfaces includes the primary display.

4. The interactive computing system of claim **2**, wherein the one or more masked surfaces includes all surfaces except those surfaces within a threshold distance of a projection plane.

5. The interactive computing system of claim **1**, wherein the visual representation includes a geometric distortion configured to cause the display environment to appear to move.

6. The interactive computing system of claim **1**, wherein the visual representation includes a color distortion configured to cause a color of the display environment to appear to change.

7. The interactive computing system of claim **1**, wherein the peripheral illusion includes a plurality of motion trackers synced with a changing perspective of the primary image on the primary display to enhance perception of apparent motion.

8. The interactive computing system of claim **1**, wherein the peripheral illusion includes apparent lighting that extends virtual lighting of the primary image as displayed by the primary display.

9. The interactive computing system of claim **1**, wherein an element of the primary image as displayed by the primary display moves from the primary image to the peripheral illusion.

10. The interactive computing system of claim **1**, wherein an element of the peripheral image as projected by the environmental display moves from the peripheral illusion to the primary display.

11. The interactive computing system of claim **1**, wherein the peripheral illusion includes a full color extension of the primary image.

12. The interactive computing system of claim **1**, wherein the peripheral illusion includes an extension of high contrast edges of the primary image.

13. The interactive computing system of claim **1**, wherein the peripheral illusion includes an extension of selected elements of the primary image.

14. The interactive computing system of claim **1**, further comprising a peripheral input configured to receive a depth input from a depth camera, the depth input identifying a location of the primary display and features of display environment on which the peripheral illusion is projected, the instructions further executable by the logic machine to generate and output the peripheral illusion based at least on the depth input from the depth camera and the location of the primary display.

15. One or more storage machines holding instructions executable by one or more logic machines, the instructions configured to provide an immersive display experience within a display environment, the instructions configured to:

recognize a position of a primary display in the display environment; and

output a peripheral image to an environmental display for display as a peripheral illusion around the primary display, the peripheral illusion including a visual representation of the display environment on which the peripheral illusion is projected.

16. The storage machine of claim **15**, wherein the peripheral illusion is masked from one or more surfaces in the display environment.

17. The storage machine of claim **15**, wherein the one or more masked surfaces includes the primary display.

18. The storage machine of claim **15**, wherein the environmental display is a see-through display and the peripheral illusion is an augmented reality image displayed by the see-through display.

19. An interactive computing system configured to provide an immersive display experience within a display environment, the system comprising:

a peripheral input configured to receive a depth input from a depth camera;

a primary display output configured to output a primary image to a primary display;

an environmental display output configured to output a peripheral image to an environmental display;

a logic machine operatively connectable to the primary display via the primary display output, to the environmental display via the environmental display output, and to the depth camera via the peripheral input; and

a storage machine holding instructions executable by the logic machine to:

determine a location of the primary display from the depth input;

output the primary image to the primary display; and

output the peripheral image to the environmental display for projection as a peripheral illusion masked from the determined location of the primary display, the peripheral illusion including a visual representation of at least a portion of the display environment on which the peripheral illusion is projected.

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